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A Report
To The Georgia Ports Authority On The Feasibility Of Bulkhandling Facilities At Savannah

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To The Georgia Ports Authority On The Feasibility Of Bulkhandling Facilities At Savannah

Industrial Development Branch
Engineering Experiment Station
Georgia Insitute of Technology

December 27, 1956

Foreword

The pages which follow report the findings of Project B-117, undertaken for the Georgia Ports Authority by the Industrial Development Branch of the Engineering Experiment Station of the Georgia Institute of Technology.

The applied nature of the project reflects our interest in meeting the research needs of both State agencies and private firms. Like most of the work of the Branch, this study served two purposes: First, it was designed to produce information of practical value in the solution of a problem confronted by an agency outside the Experiment Station. Second, by its very nature it furthered the basic research program of the Industrial Development Branch.

I would like to acknowledge the valuable assistance given us by the firms and individuals listed under Part II. The compilation of freight rates by Mr. Claude Newman, Traffic Manager of the Ports Authority and the preparation of statistics on the Ports of Savannah by Mr. Eddie Waters of the Authority's Savannah office is also deeply appreciated. Staff members of other branches of the Experiment Station were also most helpful.

The project was under the direction of Dr. Ernst W. Swanson, Senior Research Economist and director of the Branch's industrial economic research. Dr. John L. Fulmer, Research Economist and Professor, and Ben W. Carmichael, Research Engineer, assisted Dr. Swanson with the interviews. Other members of our research staff who participated in the study, in addition to those named above, were Research Assistants John R. Peterson and Joseph E. Kling. Mrs. Ann Edwards supervised the preparation of the manuscript.

Kenneth C. Wagner, Head
Industrial Development Branch

A SUMMARY OF FINDINGS AND RECOMMENDATIONS

Our analysis shows that bulkhandling facilities for the Port of Savannah are highly essential to the State of Georgia. They should be installed without delay, even if it is necessary to provide a part or all of the capital outlay from State funds. Surveys of the ore and chemicals importing companies in the Savannah freight rate orbit indicate a yearly volume over the next 5 years of at least 672,000 to 832,000 tons. These figures are conservative because they do not take into account future industrial expansion in the area except that already under construction or planned. Analysis of the growth potentials in Savannah's freight orbit and beyond into the Midwest indicates that additional volume is probable. Presently developing technologies may force the Chicago-Gary mills to use the rich South American and African ores in combination with taconite ores. Furthermore recent blast furnace technology, coupled with market growth may make possible within the next decade an integrated steel mill at Savannah.

Additional volume may be expected to be generated by these factors:

(1) the rapidly advancing use of the "new" metals: titanium, thorium, lithium, beryl, zirconium, and uranium;

(2) the natural growth presently underway in the region, now expected to be about 40 per cent in the next 10 years;

(3) the new growth generated by the new investment which will be attracted to the region by efficient port facilities;

(4) the trends in the State's industrial complex toward such industries as metal working, machine tools, and chemicals; this expansion would lead to greatly increased use of metal products and indirectly of ores and minerals;

(5) the increasing congestion of northern ports and river systems and the search for new ports of entry; and,

(6) the growth of foreign trade, which has been greater in the South than in the rest of the United States.

This port expansion is an investment in Georgia's future. The State's economic development demands that the State maintain its ports on a par with the rest of the regional growth. Informed people in the metals and mineral industries agree that this is the time to act if we are to exploit the opportunities of the contemporary changes in minerals, metals, and chemicals. The Georgia ports should be in a position "to beat any competition to the draw."

I. FACTS, FIGURES, AND FORECASTS

The facts are analyzed into two broad groups. Those from which fairly precise figures have been derived are presented in Section A. Those from which more generalized qualitative forecasts have been derived are presented in Section B. The first group rests upon the specific plans of companies which fall within the freight rate orbit of Savannah. The second group is based upon the general plans of these companies and of other companies outside the present rate orbit, and also upon knowledge about technological and market changes gained from business, from the Bureau of Mines, and from studies of specific industries. The first represents the fairly immediate future volume and the second, a more distant future volume.

A. Immediate Prospects for the Importation of Ores and Minerals through Savannah

Table I, following page 2, shows expected shipments of various ores or minerals. Two columns of data are presented: a minimum and a maximum. The range of shipments is given to reflect possible variations in the plans of the companies listed. These firms' shipments are those for which the Savannah rate orbit may be advantageous or equal to Mobile and South Atlantic ports. The overall figures vary from 672,000 to 832,000 tons. The chief imports will be manganese ores for which the range is 460,000 to 480,000 tons. (These data are stated in short tons.)

Manganese

There are only four importers of manganese ore in the area. These are Tennessee Products and Chemical Corporation (a subsidiary of Merritt-Chapman and Scott Corporation), The Electromanganese Division of Foote Mineral Company, Pittsburgh Metallurgical Company, and Tennessee Eastman Company. The first three produce ferromanganese primarily; the last uses the mineral in its output of non-metals products. Of the four firms the Tennessee Products and Chemical Corporation is the largest user of manganese ore. Yet its consumption does not compare with that of the Tennessee Coal and Iron Division, U.S. Steel Corporation. The latter, like many other steel producers, acquires its ferromanganese from northern companies.

Table I

The Annual Volume of Ores and Minerals Expected To Be Shipped Through Savannah Within the Next 5 Years Assuming Installation of Bulkhandling Facilities

		Annual Tonnage (Short Tons)	
		Minimum	Maximum
A.	Manganese Ore		
	1. Tennessee Products & Chem. Corp. Rockwood, Lyles-Wrigley	350,000	350,000
	2. Tennessee Eastman Co., Kingsport	60,000	70,000
	3. Foote Mineral Co., Electro Manganese Division, Knoxville	50,000[1/]	60,000
	Subtotal	460,000	480,000
B.	Ilmenite Slag		
	1. American Cyanamid Co., Savannah	100,000[2/]	165,000
	2. Cramet Co., Chattanooga	- [3/]	- [3/]
	3. Electro Metallurgical Co., Ashtabula Plant	0	30,000[4/]
C.	Sulphur	90,000[2/]	125,000
D.	Bauxite		
	1. Babcock & Wilcox Co., Augusta	12,000	12,000
E.	Salt Cake	10,000[2/]	20,000
	Total	672,000	832,000

1/ Portion of total requirements supplied by Tennessee Eastman.
2/ Based on estimates submitted by Georgia Ports Authority.
3/ Obtains monazite from Aiken, S.C. by rail. Some rutile is imported from Australia in bags; hence no bulkhandling is required.
4/ Is studying ores from Aiken, S.C.; if ores pan out well shipments will move through Savannah to the Great Lakes via St. Lawrence Seaway.

Republic Steel buys its ferromanganese largely from The Electro Metallurgical Company plant in Sheffield, Alabama. Savannah cannot compete with either the rates or the service offered Sheffield by Mobile. Pittsburgh Metallurgical has plants at Charleston, South Carolina, and Calvert City, Kentucky. Its manganese ores are shipped largely through Charleston to both of these plants. At its present levels of production the company would find no advantages from use of port facilities at Savannah. In time, however, the Calvert City plant may find Savannah more advantageous than Charleston.

Tennessee Products ships ferromanganese as far as the Chicago-Gary area to compete with U.S. Steel, E. J. Lavino and Company in Philadelphia, and Electro Metallurgical's Ashtabula plant. Lavino has ferromanganese furnaces at Lynchburg, Virginia, but Savannah cannot compete with Norfolk on either rates or service to that point. Lavino sells as far south as Atlantic Steel Company on the basis of service and thus competes with Tennessee Products and Chemical Corporation and Electromanganese Division of Foote Mineral Company.

Table I shows that the movement of manganese ore through Savannah over the next five years will range from 460,000 to 480,000 tons yearly. The largest importer is expected to be Tennessee Products and Chemical Corporation, with a total annual figure of 350,000 tons.

Ilmenite Slag, Rutile, and Sulphur

The largest buyer of ilmenite slag in the Savannah rate orbit is the American Cyanamid Company. The Port of Savannah services this company in essentially its entire purchase of the ore. President Towe informed a representative of the Industrial Development Branch of plans to (at least) double capacity at the Savannah plant. Accordingly, its requirements for ilmenite slag will increase. This company produces titanium dioxide for the manufacture of paints; it also requires sulphur in the reduction and processing of the ore. Its present purchases of ilmenite slag are approximately 100,000 tons annually and future purchases will increase to 165,000 tons. Electro Metallurgical Company is expected to purchase an additional 30,000 tons. (See Table I.)

The sole user of ilmenite in this immediate area is Cramet, Inc., of Chattanooga. This concern is owned equally by Crane Company and Republic Steel Corporation. It does not import any consequential amounts of this ore through Savannah, but it does use Australian rutile, part of which is shipped through Savannah, part through Charleston, and the remainder through northern

ports. However, in the near future it will start mining operations near Panama City, Florida, and its shipments will then be by rail almost exclusively. Republic Steel owns ilmenite rights in Mexico, but whether these will be exercised remains to be seen. Therefore, the Port of Savannah cannot expect any significant business from Cramet.

DuPont had plans for a titanium plant at New Johnsonville, Tennessee, but dropped them when the Federal government recently placed a ceiling on the quantity of titanium which it would stand ready to purchase. Wheland Company of Chattanooga ran into technical difficulties on its proposed titanium plant and abandoned its plans.

American Cyanamid and other buyers are currently bringing in around 90,000 tons of sulphur each year. This amount is expected to increase to 125,000 tons, perhaps more.

Bauxite

Bauxite users in the Savannah rate orbit are Aluminum Company of America, Reynolds Metals Company, and Babcock and Wilcox Company. Reynolds has a reduction plant at Sheffield, Alabama, but ships its alumina from either Arkansas or Texas. Bauxite is mined by the company in Arkansas and South America, but it ships the South American ore largely to Texas, where sizeable alumina and reduction plants are operated. Alcoa ships mainly through Mobile where it has its largest alumina mill. It is now locating a new alumina plant at Point Comfort, Texas, and is rebuilding the plant at East St. Louis, Illinois. The bauxite for the East St. Louis plant comes primarily from Arkansas.

The chief user of bauxite in the Savannah immediate rate orbit is Babcock and Wilcox at Augusta. This company produces refractory brick in which aluminum oxide is used as a binder and stabilizer. The amount normally shipped through Savannah will probably not exceed 12,000 tons. Recently shipments have been sizeable in part because the company is stockpiling ore for the National Production Administration. Plans for further expansion are not contemplated.

No other significant users of aluminum ores are found in the area.

Salt Cake

The largest importer of salt cake (sodium sulphate) into Savannah is, of course, Union Bag-Camp Paper Company. There are several small buyers whose quantities raise the total expected importation to 20,000 tons. The exact rate

of growth in imports of this commodity cannot be predicted because market prices abroad have much to do with the demand for it. American producers are fairly competitive and could change the market rather rapidly.

The Bowaters Southern Paper Corporation buys all of its salt cake in the United States. Because of its inland location, it apparently cannot take advantage of the economies afforded by ocean transportation.

Chrome

The only significant amount of chrome brought into southeastern United States are the few thousand tons used by Pittsburgh Metallurgical at Charleston. Almost all of the chrome production is confined to the East. The chrome imports of Tennessee Products are lumped in with the manganese.

B. Long Range Prospects for Increased Volume

Analysis of economic data, of general plans of producing firms, and of the observations of informed people in the metal industries provides the basis for generalizations about the long-range future. There are numerous developments in the markets for and the methods of production of iron and steel, aluminum, and the heavy metals. While a complete picture cannot be filled in now, enough salient elements are present to establish the fact that extremely important changes are occurring or are on the way. This section evaluates their impact upon the Port of Savannah.

The Growth in Ore Importation

Chart 1 shows the almost unbelievable expansion of imports of the four major ores used by American industry. (The statistics are plotted on "log" paper which reflects the rate of change or the percentage change.) From 1946 to 1955 imports of iron ore multiplied 7 times, bauxite tripled, and manganese and chromite more than doubled. By 1970 leaders of the steel industry expect capacity to increase by 47 per cent. The aluminum industry will expand almost this much by 1960! These predictions are based on expected population growth, rising standards of living, and changes in the industrial complex. Except for iron ore, the United States is almost completely dependent on ore imports. Even in the case of iron ore the nation is becoming increasingly dependent on outside sources. Imports accounted for 15 per cent of total iron ore used in 1955 and are expected to rise to 37 per cent of the total by 1970. Canada and South America will be the major

CHART 1

TRENDS AND PROJECTION OF ORE IMPORTS 1940 TO 1970

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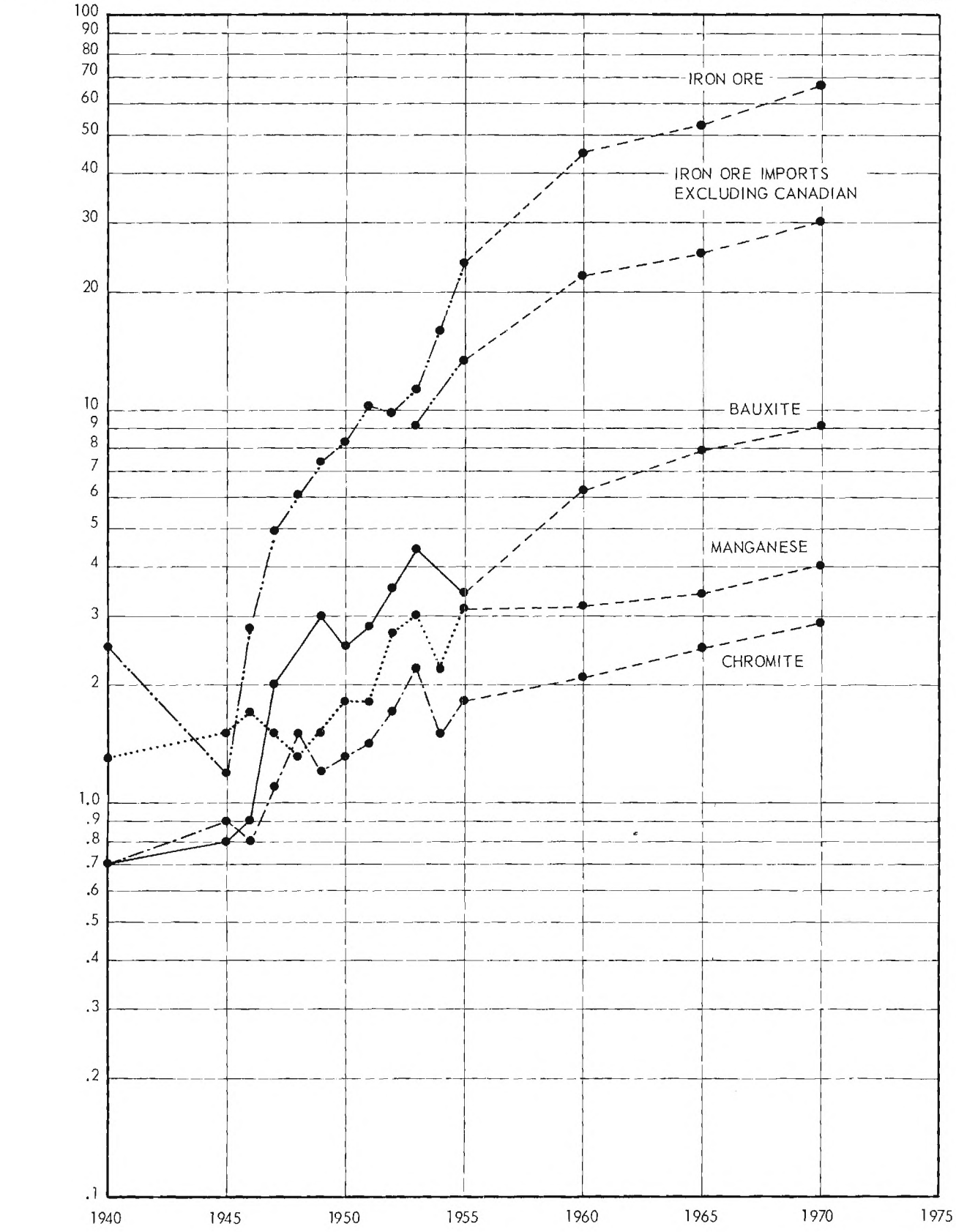

sources. Additional but less significant imports will originate in Africa. The total volume will increase 45 million tons, with sources outside of Canada accounting for 17 million tons or nearly 40 per cent.

The chart also pictures how other ore imports will have to be expanded to meet industrial growth. Over 5 million additional tons of bauxite must be imported, plus about a million tons each of manganese and chromite. These changes would involve increases of 168 per cent for bauxite, 29 per cent for manganese, and 61 per cent for chromite.

This dynamic nature of the metals producing industries dramatizes the expectations recounted in this section.

Outlook for Iron Ore

Some students of economic growth and of the location of steel plants would probably scoff at the idea that Savannah or some other southeastern port could become a steel-making center. But discussions with the Chief Economist of the Bureau of Mines, Paul McGann, the Executive Vice President of the American Iron and Steel Institute, Max D. Howell, the Chief Economist of U.S. Steel Corporation, Bradford Smith, and with others support this hypothesis. Messrs. McGann, Howell, and Smith agreed that the market for steel in the Southeast is growing at such a rate that within a few years a considerable expansion in steel production must take place there. Messrs. Howell and Smith both emphasized that the rate of expansion of the steel industry in the North has reached its peak and that the South and the West will be the next areas of significant expansion. The Bethlehem Steel Corporation is contemplating stopping further building at Sparrows Point and is looking elsewhere, probably farther south than Maryland. U.S. Steel has reached its peak in the North with the Fairless plant at Trenton and is also looking to the South. What Republic is contemplating is not definite but it, too, is planning marked changes in its new plant location.

That the iron and steel industry should seek the coast is natural. Its costs are greatly affected by the transportation of a vast amount of both raw materials and finished products. Moreover, with the decline in the richness of Alabama and Great Lake ores, other sources of iron ore have had to be found. The discovery of unusually rich deposits in Cuba, Venezuela, Peru, and Brazil, is turning a part of this great industry southward to points where ore may be landed without further transshipment. There is some doubt that any major expansion

will occur in the Birmingham district since ore will have to be moved to the area by rail from Mobile. At present over 2,000,000 tons of iron ore are coming through Mobile to be used in the existing Alabama furnaces. Increased capacity for ore handling is planned, but whether such planning will mean significant expansion in the Birmingham area may be debated.

The problem of location on the Atlantic or Gulf Coast is the unavailability of an abundant supply of coke or coking coal. But modern technology may reduce considerably the need for coal. Already, changes calling for decreased coke consumption are at hand. The rotary furnace developed in Sweden uses powdered coal in considerably reduced quantities in place of coke. The technique which employs tar, pitch, and oils rather than coke is being improved upon. These techniques conceivably would make possible furnaces at points where good water transportation is afforded. Savannah is such a place. Indeed, Mr. Smith of U.S. Steel saw no incontrovertible reason why the Georgia ports could not become steel-making centers, particularly since the ocean distances from ore mines in Africa and South America are shorter than the distances to any of the Gulf Coast ports. Mr. Howell was quite positive that the Georgia coast cities have definite advantages over others because of growing markets and new technologies.

In addition to the technologies which have been advanced to a point where new steel mills will be located on the seaboard, of vital importance is the fact that Savannah is as close to raw materials as are many producing centers. Actually, the major steel producing areas have to bring in iron ore for a considerable distance by water, frequently followed by further rail transportation. Coking coal must be hauled up to four hundred miles. Limestone typically is transported from 50 to a 100 miles and, in the case of the Lake mills, as far as 400 miles. Savannah is located competitively as to all of these requirements. The main limitation therefore is market demand. But in the next few years the market is expected to grow rapidly in the Southeast and also in the Caribbean region. Indeed, the Southeast and the Caribbean are the great new frontier.

In addition to the possibility of locating an integrated steel mill at Savannah, some years hence, there is another important consideration. The great steel mills in the Chicago-Gary region have depended exclusively upon Lake ores since the establishment of the industry there several generations ago. Now the rich Lake ores are nearly depleted; possibly 7 or 8 years of reserves are left. In fact, some authorities claim that at the present rate of growth of the steel

industry, less than these many remain. To provide other sources of ore the industry has recently concluded its basic research into the beneficiation of taconite ore, of which there are vast reserves in the Lake region. The chances are that the Chicago-Gary mills will come to depend largely on taconite ores. According to present thinking, Chicago and Gary are too distant from the Laborador mines to warrant purchase of this ore. Most of the Laborador ore is expected to be used in Canada and in the Cleveland-Youngstown-Pittsburgh region.

The fact that the Chicago-Gary furnaces must turn to taconite may open a market for some shipment of South American and African ores to that region. At present, not too much is known about either the engineering or the economic efficiency with which taconite may be used in producing pig iron. But there appears to be good reason for mixing a portion of South American or African ores with taconite to increase efficiency.

In 1957, large shipments of taconite will start moving into Chicago and Gary. Conceivably, a sizeable demand for South American and African ores could arise at the same time. These ores would have to be shipped by sea to a convenient point and then transshipped by rail. Savannah could be such a point, since it is competitive with Mobile and Norfolk.

The present iron ore rates from Savannah to Chicago are substantially less than those for Norfolk to Chicago, equal to those for Mobile, but somewhat higher than the Baltimore rates. (See Appendix Table 8.) Indeed, Savannah could give better service than either of these ports because railroads connecting the Lake cities and Savannah are less congested.

It has been argued that the iron ore could be moved by barge up the Mississippi-Illinois River system to Chicago and Gary. But the shipping cost per ton by river would appear to be far greater than by rail. An iron ore barge to be economic should carry at least 2,000 tons. Given the usual design of these barges, this weight calls for a draft of 16 to 18 feet. The Mississippi-Illinois River system allows only a 9-foot draft. In fact, in recent years a 9-foot draft has been impossible to maintain because of the prolonged drought in the Plain States. Moreover, the economic tow calls for a minimum of 12 barges, but preferably 20 to 24. Much of the river system is not adaptable to this tow and the time taken to get through the many locks would be extremely costly.

Hence, the amount of South American and African iron ores shipped into Tennesee, Kentucky, Indiana, and Illinois might become quite significant. To be sure, at first shipments would be small; but in time, several million tons may

be required in the Midwest yearly. The Port of Savannah -- if action is taken as soon as possible -- could capture a large portion of this tonnage.

Outlook for Ilmenite and Rutile

The demand for ilmenite, rutile, and other heavy earths is rising significantly. New technologies are accelerating the rate of applications of metals made from them. (See Appendix B.)

Jacksonville is already bulkhandling large quantities of ilmenite and rutile from Florida deposits. Georgia ports may be expected to handle substantial quantities soon. As an initial development, there is the possibility that Aiken County, South Carolina, ores will be shipped through Savannah. The vice president of one of the largest titanium producers in the United States informed a representative of the Industrial Development Branch that his company is now conducting extensive experiments on the Aiken ilmenites. The company's plant is situated on Lake Erie and shipment by water through the St. Lawrence Seaway is contemplated. The amount of concentrated ore to be shipped by this company alone will probably reach 30,000 tons a year. There is the further possibility of big shipments of Georgia ore a few years hence. The evidence is increasing that there are rich deposits of ilmenite and rutile in Georgia, not far from Savannah. No detailed information is as yet available on their extent; therefore, no forecast of shipments from these deposits can now be made. People at the Bureau of Mines in Washington, while they could not identify the firms for security reasons, did indicate that several companies were competing "furiously" to acquire mineral rights to certain properties in the State. The inference was clear that the deposits are large and of high quality.

That American industry is applying the new metals at a phenomenal rate is shown in Chart 2; titanium particularly illustrates this point. Ten years ago production of titanium sponge was negligible. In two years, from 1954 to 1956, it expanded from 4,000 to 12,000 tons (preliminary figure). By 1960 production is expected to be three times as great.

While titanium sponge is not produced in the Savannah area, ilmenite slag, a major source of titanium dioxide, is already heavily imported by industry there.

Going back to Chart 1, bauxite imports will continue to grow over the next decade or more. Unfortunately for Georgia, the aluminum producers are locating in Texas or on the Ohio River. Alcoa is building a reduction plant at Evansville, Indiana; Olin Mathieson Chemical Corporation at Clarington, Ohio; and

CHART 2

GROWTH IN PRODUCTION OF SELECTED LIGHT METALS

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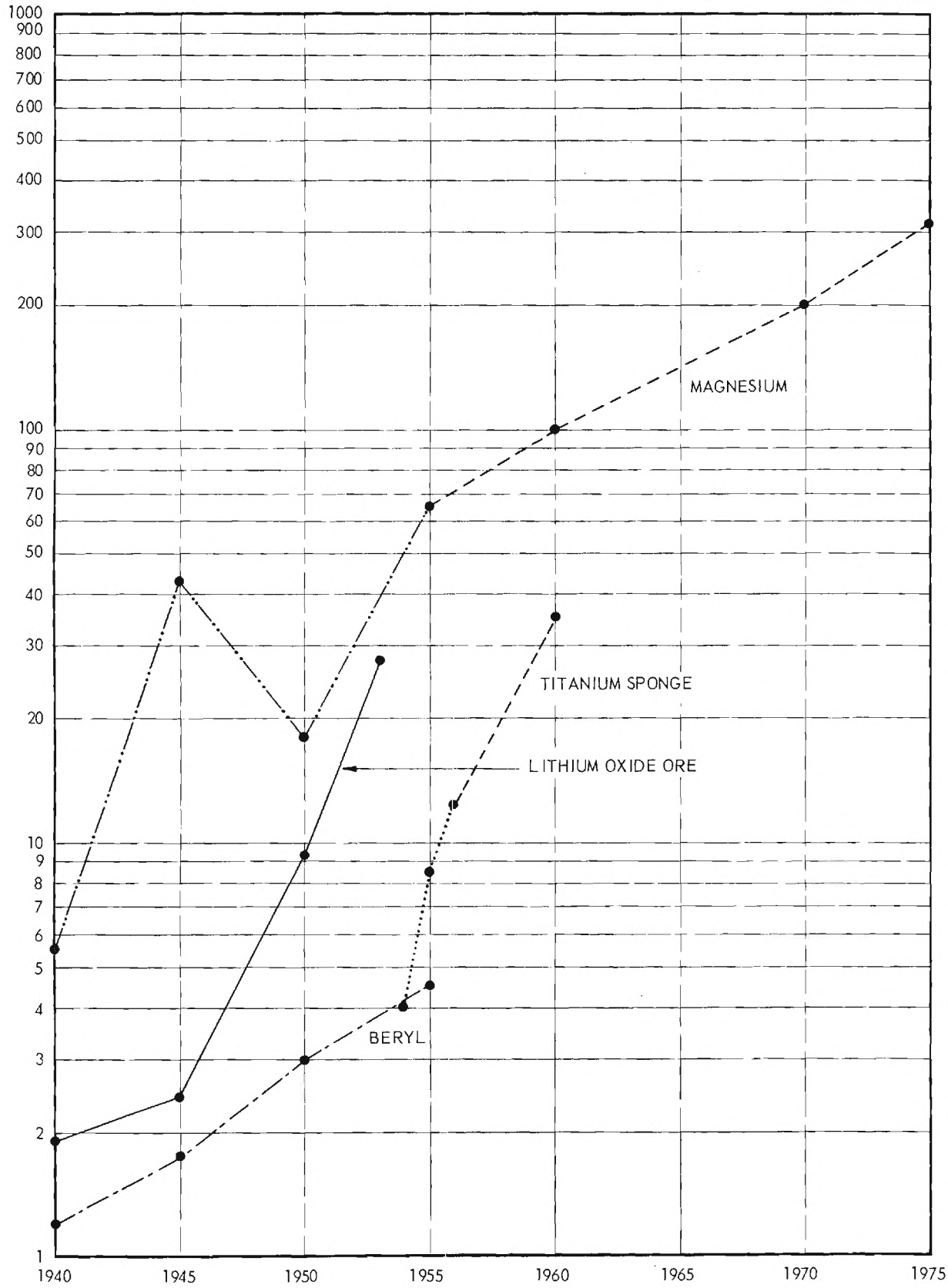

Kaiser Aluminum and Chemical Corporation at Ravenswood, West Virginia. Alumina plants are most economically located at coastal points since the production of alumina is primarily a chemical process. Ore reduction, however, requires tremendous quantities of electric energy (approximately 10 kwh per pound of aluminum pig). Hence, these plants are built near sources of low-cost power, 3 to 4 mills per kwh. Texas has low-cost electricity because of the availability of natural gas. More recently, Alcoa has turned to use of lignite for heat in generating steam for power plants. (A subsidy is believed to be involved, however.) Aside from the fact that the market there has grown rapidly, this combination of low-cost transportation and low-cost electric energy explains the rise of the aluminum industry in Texas. The location of reduction plants on the Ohio River could be attributed to the ready availability of low-cost coal in Ohio, Indiana, and West Virginia. The alumina for the Ohio plants will come from Texas, Louisiana, or Arkansas and will be shipped by rail or by river barge. The alumina used by Alcoa at its Tennessee and West Coast reduction plants is usually shipped from Mobile, where the company long ago installed a large alumina mill. Presumably, the Ohio River plant will use the same source.

A number of leading Georgians have long entertained the hope that, with the growth of the aircraft industry and other industries using increasing quantities of aluminum, a rolling mill could be established in the State. The Reynolds people recognize this potential. They go on to say that the Georgia coast is well suited for aluminum reduction. But, they add, a reduction plant requires a minimum guarantee of 100,000 kw at a price not to exceed 4 mills per kwh. Therefore, they are expanding elsewhere. The limitation may be more apparent than real, however. First, it is an observation based upon current conditions in Georgia. Second, as Mr. Donald Eilertson of the Bureau of Mines has observed: "If the market for aluminum is there, the necessary power will be provided at a reasonable cost." This viewpoint definitely substantiates the belief that an aluminum industry for Georgia is practicable in the long run.

In any event, the question whether Savannah may transship bauxite to the Ohio region may be appropriately asked. One possibility, perhaps somewhat distant, is offered. By 1960 the Ohio River will become so congested that long-distance transport of bauxite by river barge appears to be quite limited. Under these conditions, bauxite could be shipped to Savannah, there to be converted

into alumina and the transport of alumina to the Ohio River would then be feasible. How much could be shipped would depend largely upon the development of bulkhandling facilities and the competitiveness of freight rates.

Implications of Recent Trends in Foreign Trade for Future Volume Through Savannah.

During the last 15 years the nation has settled into a new economic pattern of materially greater interest in foreign trade. This development is a result of a more generally favorable attitude toward foreign trade, to foreign grants and investment, and to increasing emphasis on foreign sources of raw materials, particularly ores. From 1938-39 to 1954-55 the average annual volume of trade rose from 5.2 billion to 18.1 billion dollars; in constant (1938-39) prices the rise was from 5.2 to 7.5 billion dollars, or a 44 per cent increase.

Southern ports shared in these gains, but at an even greater rate. In the 15-year period from 1938-39 to 1954-55 the region's foreign trade quadrupled. In constant prices this increase is from 1,085 to 2,040 million dollars, or 88 per cent. Such large relative changes in volume reflect profound changes in the region's economy. Even though the volume of foreign trade has expanded phenomenally in the South in the last 15 years, both in tonnage and monetary terms, the region has become less dependent on foreign trade. In 1936-39 exports represented 9 to 10 per cent of the value of output; by 1954-55 they were down to 6 to 7 per cent. This development has been due to the entry of new products into exports, mainly manufactures and semi-manufactures. Consequently, the emphasis in imports is on ores and other raw materials.

Two other points on the changed southern economic structure are important. Due to Europe's decline as a major outlet for cotton, the region's trade has become re-oriented to South America, Africa, and Asia. Gains in trade from the Caribbean, Central and South American regions are especially important.

The impact of these gains upon the Port of Savannah is already quite evident. Since 1945 its volume of trade has increased 80 per cent. Such developments, coupled with the expected growth of the economic region surrounding Savannah, foretell a continued rise in the Port's activity. They also indicate additional volume from port-oriented industries. These will be attracted to the Port by the increased supplies of raw materials, increased potential from a

larger number of ships calling, and other activities incident to foreign trade. How much these factors have affected port-oriented industries in Georgia ports is shown by relative rates of gain as compared to the State's overall growth. From 1947 to 1955 manufacturing employment in Savannah gained 27 per cent and in Brunswick 84 per cent, as compared to 21 per cent for the State as a whole.

The expected increase in the type and character of foreign trade in the United States and particularly in the South during the next 25 years is certain to be a major factor in the expansion of the volume of bulk traffic handled. As the flow of foreign trade picks up in ports of this type, improved facilities which permit faster and cheaper loading and unloading are installed. The availability of cheaper and more dependable supplies of raw materials attracts new industries. Other industries are attracted by better potential markets from demand for turn-around cargo; others to service or to supply the growing trade. After a period of such growth, still other industries are attracted because of their relationships with industries more directly related to port volume. The process of growth feeds on itself in a cumulative fashion. In the years ahead, with the older ports becoming congested, the newer southern ports will have an opportunity for a phenomenal growth -- provided adequate port facilities and supporting communications with the hinterland are available.

II. EXCERPTS FROM INTERVIEWS

These interviews were made through direct personal contact and telephone conservations. Officers and technical personnel of concerns located in the Savannah freight rate orbit and organizations, private or governmental, affiliated with the industries being studied were contacted.

American Cyanamid Company

Mr. Kenneth C. Towe, President

The Savannah plant is at least to be doubled in capacity. The materials requirements will be proportionately increased.

The plant uses primarily ilmenite slag which is imported from Canada. But we have investigated and made explorations in the South for titanium oxide ores. (Mr. Towe preferred not to indicate findings.)

American Iron and Steel Institute

Mr. M. D. Howell, Executive Vice President, Mr. George S. Rose, Secretary, and Mr. H. C. Stringfield, Consultant in Statistics

The market for steel in the South is growing so rapidly that the issue is not whether the steel industry will expand there, but when.

As technology develops, the industry will move to the coast. (Mr. Howell was very express and emphatic on this position.) The Georgia coast offers definite advantages in the way of savings on transportation costs. (Mr. Rose reiterated the statement about the effect of new technology on the shifting of the steel industry.)

Babcock and Wilcox Company

Mr. Clinton Lewis, Assistant Production Manager

As a realistic figure, we import around 10,000 to 12,000 tons of bauxite per year. Additional amounts are obtained from Alabama mines and from Alcoa. We do not expect to increase imports.

Bureau of Mines

Mr. Paul McGann, Chief Economist; Washington, D.C.

The tendency is for big consumers of aluminum to locate near reduction plants. A good example is the new Ford aluminum castings plant at Sheffield, near the Reynolds plant. On the other hand extrusion and rolling mills are tending towards decentralization. With large use of sheets by Lockheed, an aluminum rolling mill in Atlanta offers strong advantages. (This change might later effect a location of a reduction plant in the vicinity and, should an aluminum plant be located, as a result at Savannah, then bauxite imports would rise.)

Republic Steel is looking for a new coastal location for a plant which would accommodate Liberian iron ores. The Alabama plants are too distant. These ores will probably be used in increasing quantities, since they essay as high as 70 per cent iron.

Ohio River is expected to be saturated by traffic by 1960, and ore movements by inland waterways are already too costly. This condition will open opportunities for iron ore imports through Savannah and other southern ports.

There is a possibility that it will be to the economic advantage of the Chicago-Gary mills to move African and South American ores through Savannah up to that steel district, to be mixed with taconite ores.

In 1956 titanium was the sixth most important metal in value produced in the United States. Mills can go anywhere but they are tending to locate adjacent to stainless steel mills which are equipped to do the heavy rolling required for titanium metal.

Mr. Donald Eilertson, Mineralogist for the southeastern United States; Washington, D. C.

The Georgia Coast is ripe for real industrial development. Various factors contribute to this possibility but, as a mineralogist, I would emphasize the possibilities in the use of the rare earths in the production of heavy metals, and particularly titanium.

Another possibility is the production of aluminum. I have no patience with those people who are always pointing to the need for "cheap power." My position is: get the industry by showing that the market is there and you will get the power at the right rates. This way of regional development is more common than the other: power first, industry next.

Business and Defense Administration

Mr. L. C. Cullen, Statistician; Washington, D. C.

In making titanium oxide, rutile affords the cheapest process, despite high cost of importation from Australia. Rutile is an oxide and can be reduced directly by chlorine, and the latter is easily recoverable.

In the case of ilmenite it is difficult to recover iron from the ore and chlorine from the chemical. The Electro Met Ashtabula Plant is doing research on the problem of utilizing ilmenite cheaply. It is expected that the American Cyanamid Plant at Savannah will be an outlet for the Georgia ilmenite which can come into Savannah by barge.

In the case of zirconium, the Babcock and Wilcox Plant at Augusta is a potential outlet. This mineral would enter into the manufacture of refractories materials.

Cramet, Incorporated

Dr. P. W. Bakarian, Vice President and General Manager

Our firm gets its titanium oxides (rutile and ilmenite) from Australia, Florida, South Carolina, and Virginia. Much of this ore comes in through

Savannah and some through ports farther north.

The mining of thorium and other heavy minerals is done in mines near Chattanooga. There are no imports of these ores.

We expect to open titanium oxide mines in western Florida and this ore will be shipped by rail.

Electromanganese Division, Foote Mineral Company

Mr. Douglas Collins

Mr. Collins confirmed figures collected from other sources.

Electro Metallurgical Company

Mr. W. E. Comb, Vice President of Production

We import 4,500 to 5,000 tons of manganese a month through Mobile for the Sheffield Plant.

We produce titanium sponge at our Ashtabula Plant and are at present importing rutile from Australia and elsewhere. This ore comes through eastern ports and the Great Lakes. We are looking into some new deposits at Aiken, South Carolina, and are carrying out experiments with ilmenite from Aiken. This development may lead to sizeable shipments through Savannah, since transportation savings of shipping by sea may be pretty big; further study will be made.

We do not plan any expansion immediately in the South. The Ashtabula Plant will probably be increased. But if Savannah should prove advantageous for shipping ilmenites, certain processing operations might be set up in the South.

E. J. Lavino and Company

Mr. Andrew Leigh, Vice President of Production

Lavino operates furnaces in Philadelphia and Lynchburg, Virginia. We have refractories in Philadelphia and Ohio.

We are confining our expansion to these locations, even though we ship to Atlanta and Birmingham. The Lynchburg addition will take care of the South for years to come.

Most of our ores, manganese and chrome, comes through Baltimore and Philadelphia. Norfolk handles a small amount. But the making of ferromanganese involves mixing of various ores so that a furnace at any one point may use ores

shipped through the three ports.

Lavino buys from the Gold Coast, India, and Portuguese East Africa. The African suppliers have been selling just about their total output to us for a score or more years.

Reynolds Metals

Mr. Maxwell Caskie, Jr., General Counsel

Reynolds' plants are all west of the Mississippi and hence the imported ore comes through the Gulf Ports.

The company has considered Georgia and Savannah as possible locations but it has been uncertain about availability of power and fuel at competitive prices. Because of a new plant at Massena, New York, (St. Lawrence area), no further investigation of Georgia is being made. Instead the company expects to go westward with the next expansion.

Tennessee Corporation

Mr. B. W. Bellinger, Executive Vice President, Mr. Strang, Statistician, and Mr. Lemming, Traffic Department

We find shipping of phosphates by sea too costly for our locations. All phosphates, mineral and processed, move north by rail from Tampa. Acid from Copperhill is shipped by rail to several cities in the South and the Midwest.

Tennessee Products and Chemical Corporation

(Subsidiary of Merritt-Chapman and Scott Corporation) Mr. W. W. Glenn, Traffic Manager and Mr. P. H. Brause of the parent company

We are putting in a battery of 12 new electric furnaces at Rockwood and expect to be importing 350,000 tons of manganese and chrome annually, to go to Chattanooga and Rockwood.

Shiploads usually will run from 4,000 to 10,000 tons depending on the availability of charter space.

Savannah is not used by us now because bulkhandling facilities are not available. The company uses charter ships (apparently exclusively) and is subject to demurrage charges in case of delays. But rates through Savannah should be equal to or better than any in any other port. Hence, Savannah would become the best port from our standpoint, were there proper unloading facilities.

Union Bag-Camp Paper Company

Mr. Bouchel and Mr. Reckling

Union Bag is importing currently at a rate of 25,000 tons of salt cake a year. But this is a very large figure; the annual average runs from 10,000 to 15,000 short tons.

(Mr. Reckling suggested that, were there room for storage facilities for salt cake, someone would profit in purchasing the salt cake in large quantities and marketing it throughout the Southeast. The imports would then be larger because he has no doubt but what the Southeast "uses thousands of tons.")

United States Steel Corporation

Mr. H. A. Phelps, Director of Public Relations and Assistant to the Chairman of the Board; and Mr. Bradford Smith, Chief Economist.

(Mr. Phelps is submitting a group of questions to Mr. Wievel, President of their Tennessee Coal and Iron Division; the reply has not as yet been received.)

Mr. Smith: Steel expansion beyond the Fairless Plant will take place in the South and West.

The chances are pretty good now that the Sparrows Plant at Bethlehem Steel will not be expanded much beyond its present capacity. And the corporation will go elsewhere. (Where, Mr. Smith could only surmise but he believed the South would get Bethlehem's expansion.)

Technologies are advancing rapidly towards the point where coke may not be necessary. Consider the hydrogen process! As this development advances the chances are very good that new steel mills will be erected on the Southeast Coast or, possibly, the Gulf Coast.

Addenda: Statements from Correspondence:

Bowaters Southern Paper Corporation

Mr. K. O. Elderkin, Vice President and General Manager

Our firm does not import any of its chemicals. (Location inland precludes paying added transportation from abroad.)

Tennessee Eastman Company

Mr. James C. White, President

Manganese is the only mineral of any consequence we procure outside the country for our operations at Kingsport.

APPENDIX A: IMPORTS OF ORES THROUGH SELECTED PORTS

Data on imports through the ports from Baltimore around the Atlantic Goast and the Gulf to New Orleans indicate that Baltimore imported more of the four ores (iron, bauxite, manganese, and chromite) than all the others together. Baltimore is the dominant port by far in imports of iron, manganese, and chrome while Mobile and New Orleans lead in the case of bauxite. Proximity of Baltimore to the center of the steel industry and Mobile and New Orleans to the aluminum industry explain control of their respective ores. See Tables 1-4.

Of the six ports only Charleston and Savannah do not have modern bulk unloading equipment. Savannah handled only small quantities of these ores in 1955. Important increases in the imports of iron and manganese ores are expected if bulkhandling equipment is installed. The movement of ilmenite slag, sulfur, and other minerals should also rise significantly.

Analysis of the data shows that Savannah is strategically situated. Comparisons of distances of Savannah and other ports to countries of origin indicate that Savannah is closer or equally close as the other ports in terms of the importations of 43 per cent of the iron ore tonnage, 45 per cent of the manganese tonnage, 43 per cent of the chromite tonnage, and 91 per cent of the bauxite tonnage. Although the areas of consumption are less favorably situated to Savannah, the port may expect to handle additional tonnages to the middle western industrial complex aside from the ores used by the firms in its freight rate orbit. The exact amount depends upon the ability of other ports and their supporting rail facilities to move the increased quantities of ores which will be needed by industry.

APPENDIX TABLE 1

Imports of Iron Ore Through Selected Ports
by Country of Origin - 1955
(Thousands of Tons)

Origin	Savannah	Mobile	Charleston	Norfolk	New Orleans	Baltimore
Algeria		22.7				
Brazil				201.8		350.4
British W. Africa						10.7
Canada		79.4		245.0		3046.7
Chile		54.5				948.7
Cuba					5.6	
Dominican Republic						11.1
Liberia		11.1		57.3		67.6
Peru		69.9				812.2
Sweden						639.1
United Kingdom				1.7		
Venezuela		1800.9				3033.0
Total		2038.5		505.8	5.6	8919.5

Source: Bureau of the Census

APPENDIX TABLE 2

Imports of Manganese Ore Through Selected Ports
by Country of Origin - 1955
(Thousands of Tons)

Origin	Savannah	Mobile	Charleston	Norfolk	New Orleans	Baltimore
Angola		3.4		23.9	2.4	38.8
Argentina						5.3
Belgian Congo				13.5	0.2	151.4
Brazil		24.1				157.8
British W. Pacific Isles						10.8
Chile					4.4	8.5
Cuba	12.2	39.5	34.5	21.4		181.8
Egypt						143.2
France						8.1
French Morocco				10.1		43.2
Gold Coast		51.8		81.1		45.3
Greece						3.2
India		46.4		53.3		1005.5
Indonesia				3.5		1.2
Japan						33.5
Mexico				3.4		12.6
Norway						19.1
Peru		11.0				3.9
Phillipines						1.1
Portuguese Asia		13.8				7.2
Rhodesia & Nyasaland					1.0	4.5
Turkey			10.3			25.7
Union of S. Africa		38.6		22.1	2.8	185.6
West Germany						11.3
Total	12.2	228.6	44.8	232.3	10.8	2108.6

Source: Bureau of the Census

APPENDIX TABLE 3

Imports of Chromite Through Selected Ports
by Country of Origin - 1955
(Thousands of Tons)

Origin	Savannah	Mobile	Charleston	Norfolk	New Orleans	Baltimore
Cuba			10.8	22.7	3.7	33.0
France						0.5
Greece						1.5
India				4.6	5.3	18.0
Iran						2.1
Japan						1.8
Mozambique		8.3				
New Caledonia		10.7				11.2
Norway						1.1
Pakistan				2.2		4.2
Phillipines				14.2		347.8
Rhodesia & Nyasaland				126.2	18.1	147.1
Sweden					0.1	2.2
Turkey		24.7		122.0	28.2	148.5
Union of S. Africa				28.6	62.0	146.3
Yugoslavia			5.6	3.3		0.6
Total		43.7	16.4	323.8	117.4	865.9

Source: Bureau of the Census

APPENDIX TABLE 4

Imports of Bauxite Through Selected Ports
by Country of Origin - 1955
(Thousands of Tons)

Origin	Savannah	Mobile	Charleston	Norfolk	New Orleans	Baltimore
Brazil					484.0	
Belgium						0.3
British Guiana	11.4	179.9				8.7
Denmark						0.2
Jamaica		212.5			1675.5	
Netherlands						0.8
Norway						0.1
Surinam	17.9	2084.5			523.4	
Sweden						0.1
Trieste						0.1
Union of S. Africa						0.1
United Kingdom						1.1
Total	29.3	2476.9			2682.9	11.5

Source: Bureau of the Census

APPENDIX B: THE NATURE AND USES OF THE HEAVY EARTHS AND HEAVY METALS

Among the most important heavy earths are ilmenite, rutile, zircon, tourmaline, kyanite, garnet, uranium and others. Deposits of these earths are found at intervals from Virginia through Florida. Prospecting by governments and private companies has been going on for many years and new deposits are being discovered periodically. Some of these are big but others are too small to warrant present exploitation.

The discoveries up to now have not been as great in Georgia as elsewhere, partly because prospecting has not been as extensive here as in many other states, partly because of thick overburdens, and partly for other reasons. There appear to be abundant deposits of ilmenite and monazite sands along the Georgia coast and several large metal producing companies are showing considerable interest in certain areas. Conceivably, other deposits exist. These heavy earths are a product of the weathering of the Appalachian mountains whose granite is a mixture of these earths and other minerals. The weathered materials have over the ages been washed towards the sea and have accumulated at certain points inland, especially at the edge of the Piedmont Plateau. At still other points the flows have been strong enough to carry the earths to the sea where they have formed a large portion of the beach sands in several sections of the Coastal Plains. At still other points they have become a part of the kaolin clays.

Georgia has many of the geological characteristics which indicate the possibility of deposits in several counties. A Bureau of Mines report (RME-3127) has this to say about the age when the rare earth sands were formed ... "The parent Savannah River flowed into the Cretaceous sea somewhere near the present city of Augusta. Concentration of heavy minerals undoubtedly took place near the river mouth and adjacent shore lines were enriched with heavy minerals transported by the river." Sediments several hundred feet deep were deposited. Hollow Creek, Aiken County, is the site of a portion of these deposits. They may extend a considerable distance into Georgia.

Ilmenite and rutile ores are used in making titanium and titanium dioxide. Titanium metal is gaining in use in automobile and aircraft manufacture. Titanium dioxide is used extensively in paint but more and more of it is going into ferroalloys, cemented carbides, welding-rod coating, and certain chemicals.

Zircon is used for the most part in refractories, porcelains, and certain types of glass. Photoflash bulbs, radio tubes, and electrodes also contain it. The largest applications of thorium are in the making of nitrates, refractories, polishing compounds and chemicals. Thorium oxide is the catalytic agent in the process of converting coal into oil.

Zircon goes into the manufacture of filaments for incandescent lamps, into flashlight powders, ceramic brick and ware, refractories, oxides and chemicals, alloys, and foundry sand. Garnet is mixed with other elements to form grinding and polishing compounds and is a general abrasive substance. Kyanite is essential to the making of refractory bricks for lining of high-temperature furnaces and is used particularly in aluminum reduction furnaces. Tourmaline was first applied in World War II in the sensitizing of crystals essential to radio-control and radar devices. It is taking on other uses where sensitivity to low-voltage electric currents is required.

The uses of uranium need not be discussed here.

APPENDIX TABLE 5

RAIL RATES ON CHROME ORE

In cents per ton 2240 lbs.
(From Shipside except when to Southern Destinations)

To	Mobile	Savannah	Norfolk	Baltimore
Chicago, Ill.	869a	869a	869b	869b
E. St. Louis, Ill.	869a	869a	1026b	1026b
Gary, Ind.	869a	869a	869b	869b
Milwaukee, Wis.	869a	869a	869b	869b
St. Paul, Minn.	1685a	1685a	1685c	1685c
St. Paul, Minn. (1)	1618a	1685a	1685c	1685c
Pittsburgh, Pa.	1252d	1252d	668b	668b
Youngstown, Ohio	1252d	1252d	668b	511b
Atlanta, Ga.	373f	373f		
Birmingham, Ala.	369f	432f	641f	
Chattanooga, Tenn.	407f	407f	498f	
Knoxville, Tenn.	528f	528f	577f	
Rockwood, Tenn.	437f	437f	503f	

1. Applicable only when imported from Europe and Africa.

a. Southern Ports Foreign Freight Committee Tariff 1021-G
b. Trunk Line Tariff Bureau Tariff 23-q
c. Trunk Line Tariff Bureau Tariff 37-I
d. Southern Ports Foreign Freight Committee Tariff 1022-I
e. Southern Ports Foreign Freight Committee Tariff 1028-E
f. Southern Freight Association Tariff 78-J

Source: Georgia Ports Authority

APPENDIX TABLE 6

RAIL RATES ON MANGANESE ORE

In cents per ton 2240 lbs.
(From shipside except when to Southern Destinations)

To	Mobile	Savannah	Norfolk	Baltimore
Chicago, Ill.	869a	869a	869b	869b
E. St. Louis, Ill.	869a	869a	1026b	1026b
Gary, Ind.	869a	869a	869b	869b
Milwaukee, Wis.	869a	869a	869b	869b
St. Paul, Minn.	1685a	1685a	1685c	1685c
St. Paul, Minn. 1/	1618a	1685a	1685c	1685c
Pittsburgh, Pa.	1252d	1252d	668b	668b
Youngstown, Ohio	1252d	1252d	668b	566b
Thompson, Utah	1772e	1772e	1772c	1772c
Atlanta, Ga.	373f	373f		
Birmingham, Ala.	369f	432f		
Chattanooga, Tenn.	407f	407f	498f	
Kingsport, Tenn.	577f	528f	528f	831
Knoxville, Tenn.	528f	528f	469f	
Rockwood, Tenn.	437f	437f	503f	

1/ Applicable only when imported from Europe and Africa.

a. Southern Ports Foreign Freight Committee Tariff 1021-G
b. Trunk Line Tariff Bureau Tariff 23-q
c. Trunk Line Tariff Bureau Tariff 37-I
d. Southern Ports Foreign Freight Committee Tariff 1022-I
e. Southern Ports Foreign Freight Committee Tariff 1028-E
f. Southern Freight Association Tariff 78-J

Source: Georgia Ports Authority

APPENDIX TABLE 7

RAIL RATES ON BAUXITE ORE

In cents per ton 2240 lbs., except as noted
(From shipside, except as noted)

To	Mobile	Savannah	Norfolk	Baltimore
E. St. Louis, Ill.[1/]	575a		628g	628g
E. St. Louis, Ill.[2/]	427a			
Chicago, Ill	628a	628a	628g	628g
Atlanta, Ga. [4/]	612f	612f		
Badin, N. C. [3/]		430f	430f	
Columbus, Ga. [4/]	612f	612f		
So. Augusta, Ga.[4/]		374f	653f	

1/ Plus Handling charge where applicable when from Mobile, Ala.
2/ Plus Wharfage and Handling where applicable and subject to aggregate minimum of 1800 tons of 2000 lbs. per shipment.
3/ Plus Wharfage and Handling where applicable.
4/ Per ton 2000 lbs.

a. Southern Ports Foreign Freight Committee Tariff 1021-G
f. Southern Freight Association Tariff 78-J
g. Trunk Line Tariff Bureau Tariff 43-H

Source: Georgia Ports Authority

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APPENDIX TABLE 8

RAIL RATES ON IRON ORE

In cents per ton 2240 lbs., except as noted
(From shipside, except as noted)

To	Mobile	Savannah	Norfolk	Baltimore
E. St. Louis, Ill.[2/]	478a		759b	759b
Granite City, Ill. [2/]	478a			
Chicago, Ill.[1/]	654a	654a	654b	530b
Chicago, Ill.[1/]	583a	583a	654b	530b
Birmingham, Ala.[3/&4/]	227f	289f	428f	
Gadsden, Ala.[3/&4/]	227f	289f	405f	
Lyle, Tenn. [4/]	347f	347f	377f	
Rockwood, Tenn. [4/]	347f	347f	347f	

1/ Applicable only when imported from Europe and Africa.
2/ Plus wharfage and Handling where applicable when from Mobile, Ala. and subject to aggregate minimum of 1800 tons of 2000 lbs. per shipment.
3/ Rates per ton 2000 lbs.
4/ Plus wharfage and handling where applicable

Source: Georgia Ports Authority

APPENDIX TABLE 9

In cents per 100 lbs.
(From shipside, except as noted)

To	Mobile	Savannah	Norfolk	Baltimore
Chicago, Ill.	76a	76a	76b	76g
Chicago, Ill. 2/	73a	73a	76b	76g
Indianapolis, Ind.	72a	72a	72b	72g
Indianapolis, Ind.	69a	69a	72b	72g
Milwaukee, Wis.	78a	78a	78b	78g
Milwaukee, Wis. 2/	75a	78a	78b	78g
St. Paul, Minn.	106a	106a	106c	106c
St. Paul, Minn. 2/	103	106a	106c	106c
Emco, Ala. 1/	46f	51f	58f	
Sylacauga, Ala. 1/	34f	37f	48f	

1/ Plus wharfage and handling charge where applicable.
2/ Applicable only when imported from Europe and Africa.

Source: Georgia Ports Authority